

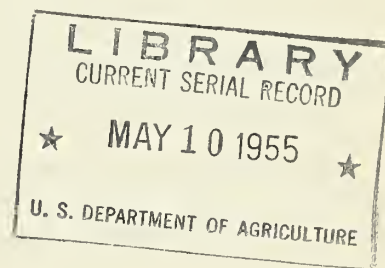
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MARKETING ACTIVITIES



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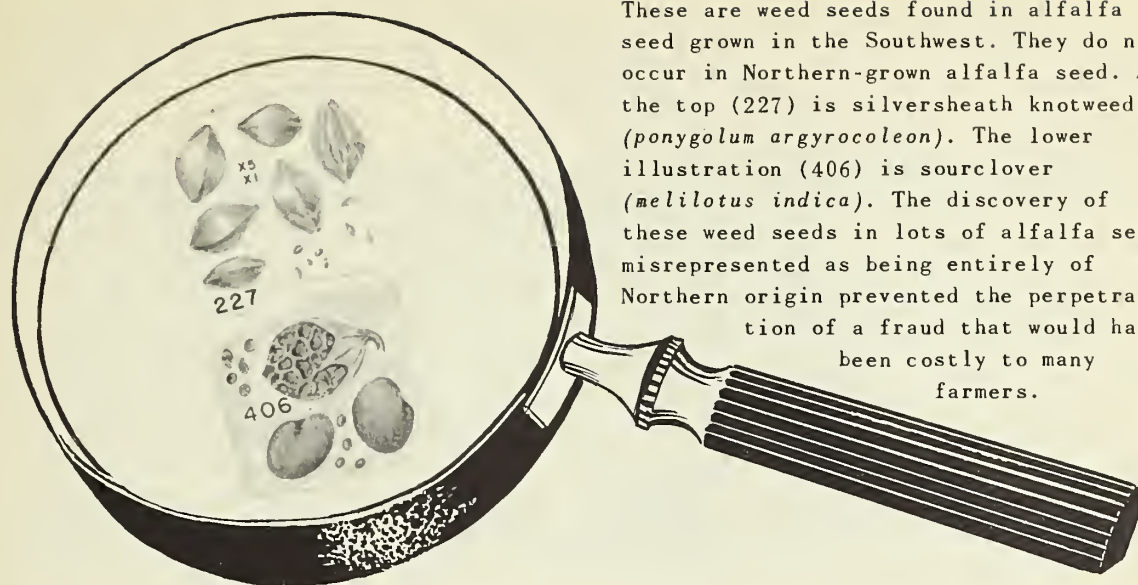
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These are weed seeds found in alfalfa seed grown in the Southwest. They do not occur in Northern-grown alfalfa seed. At the top (227) is silversheath knotweed (*ponyolum argyrocoleon*). The lower illustration (406) is sourclover (*melilotus indica*). The discovery of these weed seeds in lots of alfalfa seed misrepresented as being entirely of Northern origin prevented the perpetration of a fraud that would have been costly to many farmers.

X Seed Detectives Prevent Frauds X

The story of how thousands of northern alfalfa growers were protected against heavy losses in the production of their crops is contained in the Federal Seed Act records of the Agricultural Marketing Service. These case histories are striking examples of how buyers of agricultural seeds are safeguarded against fraud by the close cooperation of State and Federal seed law enforcement officials.

The records reveal that approximately 1,000,000 pounds of low-priced, southern-origin alfalfa seed was misrepresented by a few seed firms as being higher-priced seed of northern origin. If this fraud had been successful, northern farmers, in addition to paying double or more the value of the seed, would have faced loss of most of their alfalfa crops from winter-kill. Fortunately, most of this seed was seized or discovered before it could be distributed locally and sold to farmers. The perpetrators of the fraud were apprehended, brought to trial, convicted, and assessed the penalties provided by law.

Penalties Assessed

The final case in a series of court actions which were begun early in 1951 was concluded late last year. In all, 12 criminal cases were filed against 8 firms and 7 individuals alleging violations of the Federal Seed Act. Nine individuals were prosecuted for conspiracy to violate the Act and two for violation of the Mail Fraud Statute. The fines assessed totaled \$25,755.40. Two individuals were placed on probation for one year and another for two years and still another for 6 months. One defendant was sentenced to imprisonment for one year and a day for violation of the Mail Fraud Statute.

The way the fraud was discovered and those behind it were caught is an interesting tale with some of the elements of the true detective story --scientific deduction and plenty of routine checking. But before it is told, a bit of background is necessary.

State and Federal seed acts, dating back 40 to 50 years, are among the oldest regulatory services furnishing protection to farmers. The Federal law, which is administered by the Seed Branch, Grain Division, AMS, requires that seed shipped in interstate commerce be labeled with information describing its quality (not grade) and prohibits false labeling and false advertising. Dovetailing with the laws of the 48 States which have detailed labeling requirements for seeds sold within their borders, the Federal Act requires the same basic information on labels of seed moved in interstate commerce. A memorandum of understanding provides a basic working relationship between each State and the Federal Government in seed law enforcement. As a result, over 300 State inspectors sample seed subject to the Federal Act, providing better administration of State laws and giving additional strength to the Federal law.

Special Requirements for Alfalfa and Clover Seed

In addition to other requirements, alfalfa and red clover seeds are required to be labeled to show their origin - the State in which they were grown. For qualified seed dealers the Seed Branch will verify the origin of these seeds. Seed of some northern adapted varieties are now produced in the Southwest but southern adapted varieties of these seed are not sufficiently "winterhardy" for the Northern States. There have been instances in the past when some of these southern adapted seeds were sold in Northern States and entire crops were lost to winter-kill.

Imported alfalfa and red clover seeds are required to be stained to indicate their origin. This includes winter-hardy seed from Canada, of which one percent must be stained violet or purple. Seeds from other countries, which would not be adaptable to growing in the Northern U. S., must be stained red. These colors are intended to show (1) that the seed is imported and (2) whether it is adaptable for growing in the U. S.

With this background, we can get on with the story.

The series of alfalfa seed frauds was set up by an unusual crop condition. In late 1950 winter-hardy northern seed was in short supply, but supplies of lower-priced, non-winter-hardy, southern seed were plentiful, particularly in California and Arizona. Usually there is about a 20 percent premium on northern-grown over southern adapted alfalfa seed, but at this time this differential was about 100 percent. Several enterprising individuals and firms evidently came up with the same idea -- buy southern alfalfa seed and adulterate or otherwise identify it as northern-grown and clean up large, quick profits.

Weed Seeds Reveal Fraud

Original discovery of the fraud came through a routine seed check of a car load of alfalfa, seed represented to be of Canadian origin, by a



The heavy growth in the center of this photograph illustrates the manner in which Southern adapted alfalfa continues to grow in the fall. On both sides are alfalfa from Northern adapted seed lying dormant. Because of its continued growth, Southern adapted varieties of alfalfa are subject to winter-kill in Northern States.

commercial seed analyst in Wisconsin. He reported his suspicions to the State seed laboratory at Madison which confirmed them and called in enforcement officials from the Federal seed laboratory at Minneapolis, Minn. In all instances, the alleged Canadian seed was found to contain seeds of silversheath knotweed (*Polygonum argyrocoleon*). This weed does not produce seed in Northern States, although its seeds are found in alfalfa seed from the Southwest. Another weed seed found in southwestern alfalfa seed, but not in northern-grown seed, is sourclover (*Melilotus indica*). It is possible to generally determine the origin or place where a lot of seed is grown from the weed seeds found in it.

Enforcement Officials Move Fast

The Federal seed officials at Minneapolis took immediate steps to seize the carload of seed at Madison, but before this could be done the car was diverted to Canada. An immediate investigation was made of the firm which had made the shipment, a seed firm in St. Paul, Minnesota. At the same time, sensing the possibilities of similar operations, the Federal officials instructed their office in Sacramento, Calif., to investigate shipments of alfalfa seed by southwestern dealers and obtain a record of shipments made to Northern States.

Collusion Discovered

A record of large truck shipments of California alfalfa seed to a firm of brokers in Minneapolis was discovered. These were the same brokers from whom the St. Paul firm claimed to have purchased Canadian alfalfa seed. A careful audit of records showed that about 600,000 pounds of alfalfa seed of California origin was delivered by the brokers to the

firm under contracts specifying seed of Canadian origin. Despite erasures on invoices and other attempts to cover up, the Federal seed inspectors were able to prove that California seed was mixed, in part, with stained Canadian seed and some of it was shipped to other States as alfalfa seed falsely represented to be of Canadian origin.

Fortunately, as far as the Federal seed men were able to determine, none of this seed was sold to farmers. The firm, two of its employees, and the brokers were not so fortunate.

The brokers entered pleas of nolo contendere to an indictment alleging a conspiracy to violate the Federal Seed Act which involved the sale and shipment of 600,000 pounds of California origin alfalfa seed falsely represented to be of Canadian origin. Two former employees of the seed firm entered guilty pleas to the same indictment. The firm entered a plea of nolo contendere to 13 counts of an indictment alleging violation of the Seed Act which involved the shipment from St. Paul to Buffalo, Cincinnati, and various points in Wisconsin of a total of 265,880 pounds of alfalfa seed falsely represented to be of Canadian origin. The seed in each of these shipments was all or partially of California origin. The two former employees of the firm entered pleas of guilty to 3 counts of this indictment also.

A United States District Court levied fines of \$5,000 against the firm, and fines of \$500 each against the two former employees, who also were placed on probation for one year.

Other Cases Discovered

Meanwhile, the investigation by the Federal seed office in Sacramento was turning up other shipments of southwestern alfalfa seed into the Northwest and Midwest. Among these were some large shipments by truck from Arizona to Iowa, which seemed to have disappeared. In reality, they were part of the most elaborate of the series of attempted frauds which were soon to be discovered by the Minneapolis seed verification office. In this case, according to an affidavit in the files of the Seed Branch, employees of one of the country's largest grain and seed handlers arranged to bring southern alfalfa seed from Arizona into Montana and South Dakota and have it reshipped to the firm in Minneapolis as seed grown in those Northwestern States.

Involved Scheme Discovered

The Minneapolis firm made arrangements through a man in a town in Iowa to purchase alfalfa seed of California origin from seed companies in Arizona. Instead of the seed being delivered to the "dummy" set-up in Iowa, it was transported by truck to a seed dealer in Montana and to another seed dealer in South Dakota. These dealers shipped the seed to the Minneapolis firm as seed grown in their respective States. The Montana dealer furnished country shippers' declarations to the U. S. Verified-Origin Service at Minneapolis representing the seed to be of Montana origin. The seed from Montana was blended with some seed from that State, but that which went through South Dakota was sent on "as is."

An employee of the Minneapolis grain company who participated in this scheme signed an affidavit describing the elaborate set up in detail and indicating that a total of 224,000 pounds of California alfalfa seed was involved. None of this seed got into farmers' hands falsely labeled.

The affidavit reveals that for four days the grain company concentrated the entire force of its cleaning plant in Minneapolis on the cleaning of mixed alfalfa seed of California and Montana origins, in order to eliminate weeds seeds which might disclose California origin, inasmuch as the visit of the Verified-Origin Seed Inspector was due at that time.

In this case, the grain company entered a plea of nolo contendere in a United States District Court to 10 counts of an information alleging violation of the Federal Seed Act. The Court assessed a fine of \$500 on each of the counts, a total of \$5,000. In a separate case, the operator of the Montana seed firm and four employees of the Minneapolis grain and seed firm entered nolo contendere pleas to violations of or conspiring to violate the Federal Seed Act. The Montana firm operator was fined \$500, three employees of the Minneapolis firm were fined \$100 each and another was placed on probation for two years. In another separate action, the operator of the South Dakota seed firm was fined \$500.

Routine Checking Turns Up Other Cases

Most of the other dealers involved in selling southwestern alfalfa seed for seed of northern origin were caught through a check of shipments from the Southwest against their sales records. A typical example of this is revealed in a photostat of an affidavit from the operator of an Ohio seed house. This affidavit states that between certain dates in 1950 and 1951 the seed house received approximately 461,500 pounds of California grown alfalfa seed; that the firm's records showed the shipment of approximately 25,000 pounds of said seed as California grown seed and that on the date of the affidavit there was 111,600 pounds of said seed on hand at the seed house. The affidavit showed:

That the balance of the seed was used in blends of Canadian grown and California grown seed and in various pasture mixtures, or was sold as California seed but was not invoiced or recorded; that the blends of Canadian and California grown seed were tagged and invoiced as Canadian seed; and that prior to blending the California seed was recleaned to remove weed seeds, such as silver-sheath knotweed, which was indicative of origin.

This dealer plead guilty to 4 counts and nolo contendere to 16 counts of an information alleging violations of the Federal Seed Act. He was fined a total of \$2,000 - \$500 each on the 4 counts and fine was suspended on the other 16 counts. Suspended fines usually are imposed by the Courts if subsequent violations occur.

The action of the State and Federal seed enforcement officials in these and the other cases brought results. Since 1951 there have been no serious complaints received by the Seed Branch of AMS with respect to misrepresentation of the origin of alfalfa seed.

x Improved Meat Retailing x

✓
By Paul F. Shaffer and Dale L. Anderson ✓

Retail food stores having service-type meat departments (where store personnel wait on customers) can materially reduce their labor and wrapping material costs by using improved operating methods and equipment developed through U. S. Department of Agriculture marketing research.

Tests of these improved methods, materials and equipment in the customer service and display functions of typical service-type meat departments resulted in an increase of 15 percent in productivity. Labor requirements were cut 4.3 man hours and wrapping material costs were reduced by \$2.30 for each 1,000 packages of meat products handled. The transfer of two items, cut-up fryers and ground beef, from a service to a self-service operation increased production in their preparation and sale by 37.7 percent and reduced the combined labor and materials costs by \$32.60 per 2,000 packages (1,000 each of the two items).

This study was a phase of a continuing research project aimed at reducing handling costs in retail food stores. It is being conducted by the Transportation and Facilities Branch of the Agricultural Marketing Service. Previously published reports have shown how economies can be effected in retail store self-service meat departments.

The Customer-Service Operation

In typical service-type meat markets a considerable part of the total time devoted to customer service is dependent on the customer. In two test stores with average weekly meat sales of \$3,000 and \$6,000 the time thus spent was 40 and 48 percent respectively.

The major operations over which employees have considerable control and where attempts were made to increase labor productivity were: (1) Obtaining meat from the display case; (2) weighing it; (3) obtaining wrapping paper; (4) wrapping and sealing the package and (5) pricing it.

In the stores studied, butcher paper for wrapping meat was torn from 18-inch rolls as needed. These rolls were along the back of the meat case, below the case doors. The average piece of paper torn from the rolls was 29.5 inches long (532 square inches). Wrapping tests, to determine the correct amount of paper needed per package, indicated considerable waste. Two sizes of presheeted paper were found adequate for all wrapping except large packages. Fifty percent of the packages could be wrapped by 12" x 18" sheets, 42 percent by 15" x 20" sheets, and only 8 percent needed larger sheets from the rolls. A change to presheeted paper and rolls resulted in an average use of 277 square inches



Figure 1.--This is the improved work station for a service-type meat department discussed in the article. The low platform-type scale has been lowered so that the dial is at eye level for both operator and customer. The scale platter is 38 inches above the floor, the proper work level for the average operator. The plywood platform on the same level as the scale platter is 7 inches wide and provides a wrapping area directly in front of the scale. The gummed tape dispenser is placed on a platform to the right of the scale. Boxes or dispensers of waxed paper are placed on both sides of the *wrap-weigh* work station, level with the bottom of the meat case doors, so that it can easily be obtained by the operator when reaching in the case for meat. Sheets of butcher paper are in the shelves directly below the scale and under them is the roll paper. In this arrangement, the more frequently used sheets (12x18-inch) are most convenient to the operator, with the 15x20-inch sheets directly below. Shelves along the back of the case just below the doors, known as *running boards*, have been removed, making it easier to reach into the case and allowing the counterman to stand nearer the customer.

per sheet, or a savings of 47.9 percent in paper used. At 5 cents a pound more for sheets over roll stock, paper costs were cut 35.9 percent. For 1,000 packages, wrapping material costs were reduced \$2.30.

In order to accomodate the use of presheeted butcher paper, and to facilitate the customer-service operation, improved work stations were designed based on the following workplace arrangement principles: (1) All tools, materials, and equipment should be located close in and directly in front of the operator; (2) there should be a definite and fixed place for all tools and materials; (3) tools and materials should be so located

as to permit the best sequence of motions; (4) the scale platform and the scale table should be at proper height above the floor; and (5) the meat in the case should be readily accessible to the operator. An improved work station is shown in figure 1, page 9. Table 1, below, shows that 0.081 man-minutes per package was saved in the customer service operation when this improved workplace arrangement was used.

Table 1.--Labor requirements for customer-service in a service meat market before and after installation of an improved workplace

Element	: Time required per package :		Savings per package
	: Before	: After	
	: <u>Man-minutes</u>	: <u>Man-minutes</u>	: <u>Man-minutes</u>
Obtain meat from display case	0.435	0.424	0.011
Weigh . . . . .	.123	.099	.024
Obtain materials and wrap . . . . .	.192	.138	.054
Price and hand to customer. . . . .	.111	.119	.008
Other elements ^{1/} . . . . .	.528	.528	-
Total time per package	1.389	1.308	.081
Personal and fatigue allowance 15 percent:	.208	.196	.012
Standard time per package	1.597	1.504	.093

^{1/} These miscellaneous elements are not affected by the workplace arrangement. They include talk to the customer, delay for customer, process meat, etc.

Displaying Meat in Service Meat Markets

To achieve the best utilization of labor in the service meat display operation certain principles should be observed: (1) A fully loaded pan, or two or more partially loaded pans, should be carried to the display case on each trip. (2) Walking and carrying should be kept to a minimum. (3) All unnecessary rehandling or reprocessing of meat should be eliminated. (4) Floor behind display cases should be on the same level as floors in cooler and meat preparation area. (5) Doors connecting meat preparation area and display area should be swinging doors or should open out in the direction of flow of product. (6) Display cases should be so designed as to provide easy access to meat and to facilitate the placing of pans of meat in the case.

Studies in two service-type markets illustrated how these principles affected labor productivity. Whereas the percentage of time spent on the various display functions was approximately the same in the two markets, the time requirements per package to display meat was considerably higher in store No. 1. This difference in time requirements was due largely to the size of the pan loads of meat displayed in the two stores. In store No. 2 the size of the average pan load was almost twice as large as for store No. 1. When the average size of the pan load was increased, there were fewer trips to the display area, less frequent rehandling of meat, fewer empty pans and interlayer (peach) paper obtained, and less handling of price tags. And, when store No. 1 displayed the same size pan load as store No. 2 and used a pass window to move the pans from the cutting room to the display area, the time per package for displaying was reduced from 0.409 to 0.246 man-minute, an increase in production of

66.7 percent. This resulted in labor savings of 2.7 man-hours per 1,000 packages.

High-Volume Items From Service To Self-Service

The old concept of the service meat market has changed considerably. It is now common practice for service-type markets to merchandise some items on a self-service basis. In the two markets studied 55 percent and 50 percent of the packages sold were self-service items. This included luncheon meat, bacon, sausage products, ham, and cheese where it was a part of the meat department. In most service-type stores the packaging of these items is performed by the meat packer.

In addition to these, there are other high-volume items which require considerable time in handling at the service counter but which require a minimum of selection by the customers. Two of these are ground beef and cut-up fryers. In one of the typical markets these two items represented 28 percent of all packages sold over the service counter.

The handling of these two items on a self-service basis would allow market personnel to do the processing during periods of the day or week when the labor demand at the service counter is less pressing. By selling fewer packages over the service counter the need for extra peak-period personnel would be reduced or eliminated, or with existing meat counter personnel the store could give the customer better service.

Cut-up fryers and ground beef were pre-packaged using sheet cellophane and a 5 x 8 x 1-inch pulp paper tray for fryers and a $4\frac{1}{2}$ x $4\frac{1}{2}$ x 1-inch pulp paper tray for ground beef. As shown in table 2, the transfer from service to self-service reduced labor requirements per 1,000 packages by 19.8 man-hours for cut-up fryers and 7.8 man-hours for ground beef. Material costs per 1,000 packages increased 1.62 for fryers and 5.19 for ground beef due to the use of film for both items and paper trays for the ground beef. Net savings, however, were \$25.90 per 1,000 packages of cut-up fryers and \$6.70 per 1,000 packages of ground beef.

Table 2.--Comparison of labor and materials costs per 1,000 packages for selling cut-up fryers and ground beef from the service counter and self-service

Item	Cut-up fryers		Ground beef	
	Man-hours	Dollars	Man-hours	Dollars
<u>Service counter sales</u>				
Labor requirements	56.2		44.4	
Materials costs		15.29		6.40
Labor and materials costs $\frac{1}{1}$		90.46		67.90
<u>Self-service with sheet cellophane</u>				
Labor requirements	36.4		36.6	
Materials costs		16.91		11.59
Labor and materials costs $\frac{1}{1}$		64.56		61.20
<u>Labor and material savings</u>				
Per 1,000 packages over service counter		25.90		6.70

$\frac{1}{1}$ Based on an average wage of \$1.38 per hour.

X Modern Livestock Trucking X

This article deals with some recent improvements in equipment for the transportation of livestock by motortruck. Over three-quarters of total livestock receipts at the 60-odd markets for which USDA Livestock Market News reports were made in 1954 arrived by truck. For a number of years there has been a steady annual increase in the percentage of truck receipts of total receipts of livestock at these markets. For the calendar year 1954, the percentage of truck receipts of total receipts for the various classes of livestock were: Cattle, 80.9 percent; calves, 82 percent; hogs, 86.8 percent and sheep and lambs, 52.7 percent.

✓
By Joseph F. Kirby

Livestock moving to market by motortruck rides in style today compared with the rough and often hazardous trip it faced just a few years ago. Open, stake-bodied, all-purpose trucks formerly used for this transportation have, to a large extent, been replaced by van-type trucks and trailers specially designed to give animals smoother, bruise-free rides with more care for their protection and comfort.

Modern livestock trucks and trailers protect the animals from the elements, from harm from the equipment, and from themselves. Innovations include such things as reflective sides and roofing, insulation, countersunk bolts, the elimination of sharp corners and projections, partitions to prevent animals from piling-up during transit, better ventilation, and even air-conditioning.

Improvements in livestock motortrucks have not stemmed entirely from humane motives. They have resulted from efforts to protect highly sensitive and very valuable cargoes, to meet competition in the transportation field, to provide for more efficient operation of equipment, to comply with labor demands and to increase labor efficiency. Other reasons are to offset the economic effects of State regulations, size and weight limitations and taxes on equipment.

Behind all this there has been a constant campaign by the livestock industry, transportation agencies, State and Federal regulatory and research groups and others to reduce the appalling loss from death and maiming of livestock during transportation. The U. S. Department of Agriculture plays an important part in this campaign and further improvements in livestock transportation may be expected from Department research.



Figure 1.--Semi-trailer van with several ventilator doors open for use as a livestock unit.



Figure 2.--Semi-trailer van with doors closed for hauling dry freight. Unit would need refrigeration equipment for hauling produce.

Several equipment manufacturers now have on the market livestock trucks, semi-trailer and full-trailer units, that feature aluminum construction with insulated roofs and sidewalls. Some of these trailers serve a dual purpose. They are so designed that they can be used to haul livestock in one direction and dry freight or fresh produce on the return trip. (Figures 1 and 2, above.)

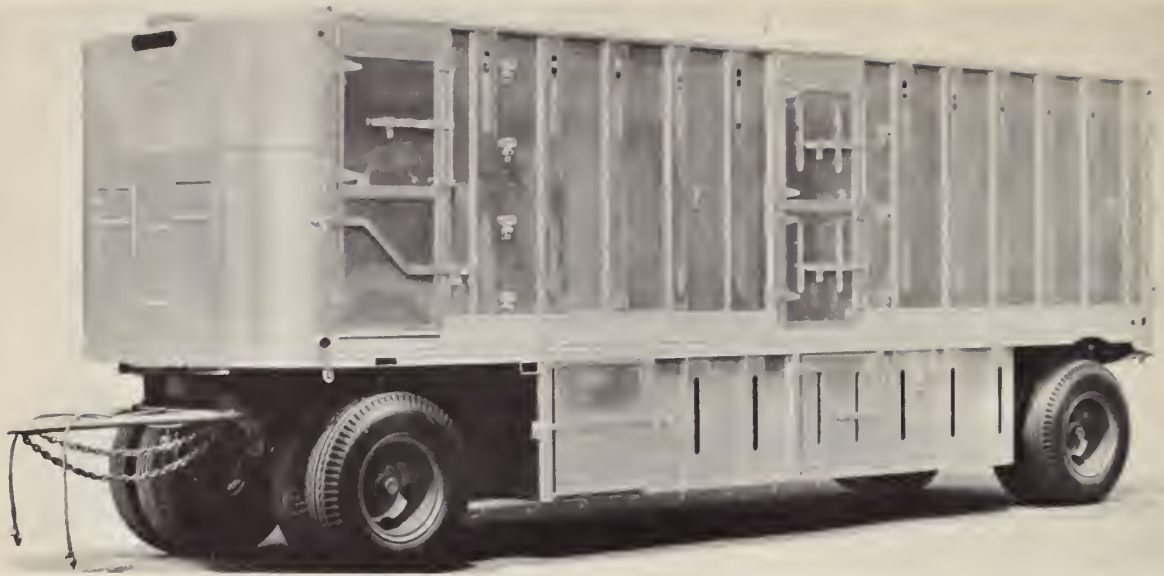


Figure 3.--The unusual feature of this unit is the addition of a third deck for hauling calves and/or sheep.

While semi-trailers predominate in livestock hauling in the East, in the far West, where length and weight limits are greater, trucks and full trailers are used extensively. There, maximum legal weight is seldom obtained when cattle are hauled, but removable second decks in some trailers permit loads close to the limit when hogs, calves or sheep are cargo. A recent innovation by one manufacturer is a third deck between the front and rear axles for hauling sheep. (Figure 3, above) The 2,000 gallon tank underneath the trailer (Figure 4, below) permits the operator to haul molasses to feeders in one direction and return with cattle the other way.



Figure 4.--Combination cattle and feed molasses unit. Tank between axles holds 2,000 gallons.

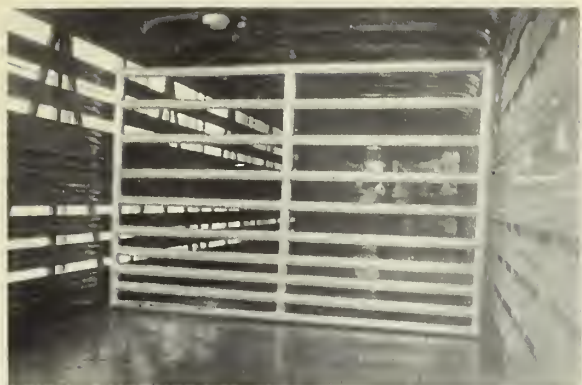


Figure 5.--New tubular, lightweight partition. Note smaller rungs in lower section.

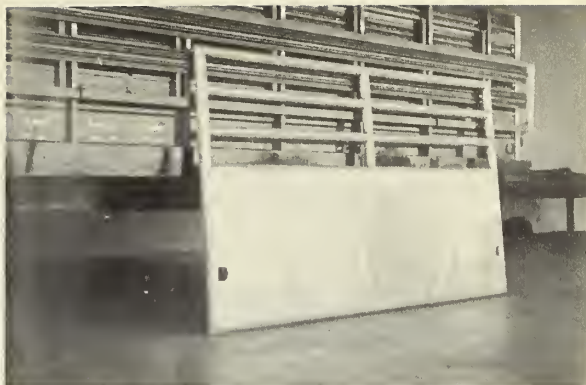


Figure 6.--New lightweight partition with tubular upper section and sheet lower section.

Equipment manufacturers and operators of livestock motortrucks have given particular attention to protecting livestock from vehicle motion. Sudden starts and stops and swaying can cause animals to pile up. Partitions or gates are used to separate groups of animals and prevent the full weight of the load being thrown against only a few animals. If the space between the cross members or rungs of these partitions is too wide, there is danger animals will cripple themselves by getting a leg caught in them. Durable, light-weight partitions now available are so constructed that this danger is eliminated. (Figures 5 and 6, above) Some types of these partitions are being sold at cost as a service to the industry.

Air-conditioned comfort for animals on their way to slaughter might seem a bit incongruous, but it reduces shrinkage which is an important economic factor in the long distance transportation of livestock. There are trailer units available, similar to those shown in figures 1 and 2, with ice bunkers up front and two large blowers operated by a small gasoline engine. These vehicles not only provide a cool ride for livestock across hot, dry areas, but also maintain sufficiently low temperatures for transporting fresh produce or other perishable farm commodities on the back haul. Other units in operation are 3-deckers, with air conditioners and blowers controlling humidity as well as temperature. Operators of these "air-conditioned" vehicles claim a substantial reduction in livestock shrinkage from Missouri River markets to the West Coast. Another important advantage, of course, is a more flexible type of motortruck operation. If these units are used for hauling food, they must be steam-cleaned thoroughly and be free of odor.

A labor saving device recently employed to avoid the cumbersome task of placing second deck boards is an adjustable, permanent upper deck of lightweight metal which is held up against one side of the trailer when not in use. The operator merely has to turn a crank to lower the deck into position. Some stake-bodied units are available which can be converted into all-weather vans for livestock or hauling dry freight with the placement of outside panels of plywood, aluminum or plastic. When not in use, the panels are carried in a box underneath the trailer.

In connection with the continuing research to further improve livestock transportation, work is underway in the Transportation and Facilities Branch, Agricultural Marketing Service, to develop means of reducing death and injury losses by providing non-slip flooring for both railroad cars and motortrucks. It is known that a considerable loss results from animals slipping and going down in transit. Several different types of flooring and floor covering have been tested by the Branch.



Figure 7.--Application of test non-skid floor covering.

Preliminary tests have been conducted with various combinations of several materials such as asphalt, fabric, cement, rubber and plasticizers to develop the best floor covering to meet the following requirements: (1) Reduce transit injuries from slipping, (2) eliminate the need of sand bedding, (3) be easily cleaned between loads, and (4) be economically feasible. A floor covering material has been developed for which 36 test installations are being arranged in 15 principal livestock markets for more intensive study. A test application of this material is shown in Figure 7, above.

Livestock Trucking Is Becoming a Large Operation

The trucking of livestock is no longer a one man type of operation. Many firms operate or lease many units, in some cases as many as 100, and as the more aggressive livestock haulers increase trucking distances, services, and the number of large and expensive units on the road, added emphasis on better management practices is essential. Such practices as pooling and leasing of idle units to other livestock haulers, the hauling of other commodities on the return trip, the equipping of truck trailers with refrigeration facilities, the use of light weight flooring, and the installation of liquid cargo tanks underneath the flooring contribute more fully to the utilization of the full potentials of the vehicle.

Industry Practices Improve Service

As more units are placed in service, livestock motortruck management has adopted practices similar to those of regular route motor carriers of general commodities such as the use of safety vehicles or an engineering service that performs this function for management. These service vehicles cruise the routes used by company motortrucks and make reports on all units -- or a designated unit or driver -- indicating traffic courtesies or violations of company rules. All such occurrences are recorded on film by a camera mounted on the dashboard of the safety vehicle. These records indicate speed of the vehicle, the mileage reading, date and time. This film and a written report are then forwarded to management for its information or for corrective action to provide livestock a safer, more comfortable ride to market.

Applied Statistics In Dairy Operations X

✓
By Fred Stein

The number of industries that use statistical techniques in their daily operations has increased in recent years. Techniques for controlling the quality of raw materials moving into the plant and of finished products leaving the plant have been developed. The purpose of this article is to call attention to a statistical technique - still in the process of full development- which will have important application in the dairy industry.

Since milk is purchased on a butterfat content basis, one of the major problems of the dairy industry has been to determine this factor as accurately and economically as possible. This is of special importance to producers whose payments for milk are partially based on an average of a limited number of fresh milk tests, to milk dealers who determine their payments on the same basis, and to cooperatives or regulatory agencies which check dealer tests by averaging a limited number of fresh tests for comparison with tests reported by dealers.

The averaged tests of daily fresh samples, weighted by the quantity of milk received daily, may be considered the ideal measure of the butterfat in a month's deliveries. However, the high costs involved in daily sampling and testing have forced the adoption of programs of a more limited nature by the industry. Therefore, the accuracy with which the average of a limited number of fresh milk tests of an individual producer's deliveries will represent the true average test in a delivery period is all important.

Measuring Variations in Daily Butterfat Tests

The manner in which a limited number of random fresh sample tests of an individual producer's milk will range around the true test can be estimated from the way that producer's tests vary from day to day. If variations between daily tests are small, the average of a limited number of fresh tests will tend to be close to the true test; if daily test variations are large, the average of the same number of fresh tests will tend to be further from the true test.

In Sampling Routines and the Accuracy of Patrons' Butterfat Tests (Marketing Research Report No. 66, AMS, Marketing Research Division, May 1954) a standard measurement of variation was calculated for each producer -- the standard deviation, which normally includes two-thirds of all observations. The average standard deviation of all the producers

was used as a basis for estimating an answer to the question, "How close will averages computed from specified numbers of daily tests come to the true average?"

Table 1.--Expected variation of the average butterfat percentages of specified numbers of random daily tests from the true monthly average *

Number of daily tests	Limits of expected variation from true average					
	2 in 3 averages		19 in 20 averages		99 in 100 averages	
	Percent		Percent		Percent	
1	0.192	:	0.376	:	0.495	:
2	0.134	:	0.263	:	0.346	:
3	0.107	:	0.210	:	0.276	:
4	0.091	:	0.178	:	0.235	:
5	0.080	:	0.157	:	0.206	:
6	0.071	:	0.139	:	0.183	:
7	0.065	:	0.127	:	0.168	:
8	0.059	:	0.116	:	0.152	:
9	0.055	:	0.108	:	0.142	:
10	0.051	:	0.100	:	0.132	:
11	0.047	:	0.092	:	0.121	:
12	0.044	:	0.086	:	0.114	:
13	0.041	:	0.080	:	0.106	:
14	0.038	:	0.074	:	0.098	:
15	0.036	:	0.071	:	0.093	:

* This table is based upon 194 producers delivering to a St. Louis plant in one month and is applicable only to a similar group of producers.

Source: Sampling Routines and the Accuracy of Patrons' Butterfat Test
U. S. Dept. Agriculture, Agricultural Marketing Service, Marketing Research
Division, Marketing Research Report No. 66 pp. 6, May 1954.

For example, in Table 1, if a random fresh test was taken on one delivery from a producer with average variability in his day-to-day test, that test would be within about 2 points (0.192%) of the true test 2 times out of every 3, within about 3-3/4 points (0.376%) 19 times out of 20, and within about 5 points (0.495%) 99 times out of 100.

Similarly, if random fresh tests were taken on 6 different deliveries of the same producer the average of these 6 tests would be within about 7/10 of 1 point (0.071%) of the true test 2 times out of 3, within about 1-4/10 points (0.139%) 19 times out of 20, and within about 1-8/10 points (0.183%) 99 times out of 100.

A table such as this, based upon the average variability of all producers, will understate the expected variations for the producer with more than average variability. However, its use seems justified until we know more about changes in individual producers' daily butterfat test differences. With more information it should be possible to determine the number and type of tables which would best serve the purpose.

Factors that Affect Variability of Tests

The study shows that high day-to-day variability in individual producer butterfat tests is associated with large fluctuations in daily producer deliveries, high-testing herds, and low volume producers. It was determined that about the same expected degree of accuracy could be attained by 3 fresh tests on the milk of a producer delivering relatively even quantities of milk from one day to the next as would be achieved by 5 tests on the milk of a producer with uneven deliveries; 4 tests for low-testing producers were equivalent to 5 more tests for high-testing producers; and 3 tests on large producers were the equivalent of 4 or more tests on small producers.

These data give some idea of the advantage of more frequent sampling of the milk of producers whose deliveries exhibit certain characteristics but it was not possible, with the data available, to determine the relative importance of each of the characteristics when two or more apply to the same producer.

Composite vs. Fresh Samples

Most investigators are in general agreement that composite samples tend to give lower butterfat percentages than fresh samples. The data in Sampling Routines bear this out - 81 percent of the monthly average of 10-day composites and 88 percent of the average of 15-day composites were lower than the monthly average of the daily fresh tests. The important point is that the averages of fresh tests fluctuated within narrow limits around the true monthly average tests. In contrast, the average of composite tests fluctuated within even narrower limits around a point representing the downward "bias".

Although tests from composite samples averaged low, Sampling Routines data show they were more consistent than averages of a limited number of fresh tests. For example, two-thirds of the differences between averages of 10-day composites and the true monthly averages could be expected to fall within a range of 1 point of butterfat. It would require 12 daily fresh samples to give differences two-thirds of which would fall in this narrow a range.

The number of daily samples that can be considered as satisfactory as 10-day or 15-day composites depends upon the criteria of acceptability to plants and their patrons, but it appears to lie between 5 and 12 daily samples in comparison with 10-day composites and between 3 and 10 daily samples in comparison with 15-day composites.

Compromising Plant Tests and Check Tests

The results of the study may be considered from the standpoint of rules for compromising differences between tests made by the plant tester and check tests. On the basis of Sampling Routines data, if both the plant test and check test were the averages of 4 daily tests (and each of the 8 tests represented a different day's delivery) the two averages would differ by more than 2 points of butterfat about 1 in 8 times.

Differences of more than 2 points occurring in more than 1 in 8 tests would indicate a "bias" in the plant tests, the check tests, or both, if both are based on 4 fresh samples.

There are important advantages to both the dealer and the producer when the expected accuracy of the average of a specified number of random fresh tests has been determined.

Future Application

The dealer is better able to evaluate his present testing program. He can increase the number of tests if the present limits of estimated accuracy are not satisfactory or he can reduce the number if satisfactory results can be achieved with fewer tests.

The producer will have increased confidence in a limited fresh testing program if he has an understanding of its expected degree of accuracy. The cooperative or market administrator, acting on behalf of the producer, has need for information on the differences between plant and check tests to be expected under widely varying conditions.

Further research is planned upon which to base sound sampling and testing programs with approximately known limits of accuracy. This work will include a study of plants of various sizes in several parts of the country for an extended period to determine the effect of seasonal, geographical and other influences on day-to-day variability in individual producer butterfat tests. Thorough knowledge of the factors related to variations in butterfat tests should open the way for the development of simple, easy to use statistical tools for arriving at a satisfactorily accurate test.